

Charnley Low Friction Arthroplasty in Old Tuberculous Hips

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＝圖文抄錄＝

股關節結核에 對한 低摩擦人工關節施術例의 檢討

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股關節結核의 治療에 있어서 이 病을 治癒시키고 同時에 關節의 機能을 改善시킬이 가장 理想的이다. 그러나 從來의 治療方法으로서 關節機能의 改善은 不可能하였으므로 良性肢位로 股關節을 固定하여 支持性을 얻어 協同運動에 依하여 日常 動作에 便宜를 가져다 줌에 滿足하였다. 그러나 化學療法 및 最近 人工關節의 發達과 더불어 關節機能의 恢復을 試圖할 수 있는 希望을 갖게 되었다. 著者들은 1973 以來 Charnley 型 低摩擦人工關節을 利用하여 40例의 陳舊性股關節結核患者의 股關節機能의 恢復을 試圖하였다. 本 研究에 앞서 基礎實驗으로서 抗生劑 混合 骨시멘트의 抗生作用 持續性에 關하여 追試하고 아울러 混合骨시멘트를 材料力學的으로 實驗하였다.

Preliminary trials are based on a retrospective study of a consecutive series of forty patients who had tuberculosis of the hip mostly for in quiescent state.

Six cases had only a short history and are included in this study. The patients were treated with antibiotics in bone cement at the time of Charnley total hip arthroplasty. So far Kanamycin in bone cement to combat infection proves satisfactory. Experiments of the clinical basis of low friction arthroplasty(LFA) are presented additionally.

Clinical Material and Provisional Protocol

Between July 1973 and July 1976, LFA was performed on forty patients both clinically and radiographically judged to have quiescent

tuberculosis of the hip with a past history of draining sinuses which had stopped more than ten years before.

In the series, the post operative follow-up less than 6 months in excluded for this study. There are 21 women and 19 men with an age range from 52 two to twenty years with an average of thirty nine years.

In most of the series in old tuberculosis of the hip in the cases here presented there is pain with restriction of movement, deformities and disabling pain in the ipsi-lateral knee or lower part of the back.

These are usually accompanied by degenerative changes in the back or so called coxitis knee with or without spontaneous fusion of the affected hip. On the other hand, five knees required correction of the deformities and one high tibial osteotomy was done subsequently

Table 1. Interval between onset of disease and LFA

Longest history	43 years
Shortest history	12 years
Two exceptions	2 years

during the postoperative period.

Provisional drug regimen consisted of Rifampicin, Isoniazide and Ethambutol for the initial three months. The first trials of the three drug combination started three weeks prior to surgery.

Table 2. Pre and Post-operative anti-tuberculous regimen.

Drug	Dose	Method of Administration
Rifampicin	600 mg/day	Oral, single dose 1/2 hour before breakfast.
Isoniazide	300 mg/day	Oral, single or divided dose.
Ethambutol	25 mg/kg for 60 days, then 15 mg/kg	Oral, single dose is preferred.
Kanamycin	1 gram	Mixed with 40 g methylmetacrylate polymer.

However, we have modified a drug regimen as well as short course chemotherapy consists of Rifampicin, Isoniazide for 6 months after M.R.C. recent trials (D.Ll Griffirus). On the clinical basis of LFA Revealed sufficient disorption and bacteriological efficiency of the Kanamycin tested for four weeks with *Bacillus Subtilis* ATCC 6633.

Subsequent study of a bactericidal inhibitive concentration test using *Mycobacterium tuberculosis* H37 Rv strain as well as Ra strain with Kanamycin and Streptomycin mixed in CMW. will be reported separately in the near future. When mixing CMW bone cement with one or two grams of Kanamycin the Modulus of elasticity is not decreased. The impact ductility is somewhat decreased by the addition of Kanamycin.

The bending strength of CMW mixed with one or two gram of Kanamycin was more suitable than a non-acrylic Kanamycin mixture.

Radiographic Assesment Before LFA

Radiographically, old lesions were traced with an additional study of tomograms in some of our series(seven out of twenty). The writer feels that tomography has great value in most cases of an old tuberculous hip (Hodgson, Yaw and Wong 1969).

We have had the opportunity of comparing the pre-operative x-rays with the findings at the time of operation and also in most cases, of confirming the biopsy with the findings at LFA.

If the distortion of the acetabulum as well as any late effect of the disease process is evident, a special view of the pelvis is essential. This will ease orientation of setting prosthetic socket in the acetabulum. The lack of femoral head and neck werealso often encountered in most of our series.

Fig. 4A-B. AC-1

Width of Femoral Medullary Cavity

A narrow femoral medullary cavity is often associated with this type of old tuberculous hip. The measurement of the width of femoral medullary canal with an additional scanogram of the femoral prosthesis is preferable in most cases.

However, it is difficult to assess a scanogram of the femoral prosthesis in most of our series because of severe flexion deformities. Therefore, we preferred to place the patient in a sitting or semi-sitting position depending on the degree of patient's deformities so that the magnification of distal femur can be prevented

while a scanogram of femoral prosthesis is undertaken. Furthermore, difficulty with reaming for femoral prosthesis was often encountered at the level of isthmus portion of the femoral medullary cavity in most of our series.

Therefore an accurate scanogram of the femoral prosthesis is very important in performing this type of surgery.

Assessment of Pelvic Radiogram

This is sub-divided into A.B.C. and D.

A. Acetabular angle.

B. Acetabular depth.

C. The obturator oblique view.

D. The iliac wing view.

A. Acetabular angle.

The Sharp acetabular angle is measured as a preoperative guide when performing LFA. The measurement is taken between the horizontal line connecting the lowest points of the "tear drop" of both hips, and a line drawn from the superior lip of the acetabulum to the lowest point of the "tear drop" on the same side.

Sharp gives the normal range for this angle as 33° to 42° . The results of the variation due to radiographic distortion by extremely bad positioning is no more than four degrees. In seventeen of the unilateral old tuberculous hip, the acetabular angle was found to lie between 37° and 52° .

B. Acetabular depth

The Acetabular depth was also measured from the line used in Sharp angle, as the greatest depth to the floor of the acetabulum on a perpendicular to this line.

The only difference in measuring between congenital subluxation of the hip and this more serious sequence of tuberculous hip is the extension of a longer perpendicular line directed to the full depth of the old suspect

lesion in the acetabulum for preoperative guidance, so as to remove the old lesion when performing LFA.

The measurements showed that of the twenty patients with unilateral hip, most of them were more or less increased in depth compared with the sound hip.

The increment of acetabular depth seems to result from the original focus of infection as well as destruction of bone during the disease process.

C. The obturator oblique view

(The patient positioned for 45° internal oblique view).

Radiographically old destruction with sclerotic change in the acetabulum make the reception of the acetabular prosthesis difficult because of lack of bony stock commonly associated with this condition. Sometime offset bore acetabular prosthesis is preferable in some of the series.

On the other hand, in a radiogram of the standard anteroposterior view it is difficult to identify the old lesion in the anterior column of the acetabulum.

The writer feels that the obturator oblique view has great value in cases of the distortion of the acetabulum.

This special view facilitates the viewing of the posterior lip of the acetabulum and also inner boundaries of the iliac profile just above the acetabulum.

D. Iliac wing view

(The patient positioned for 45° External Oblique view).

This also gives great value in tracing the old lesions as well as the identification of the poorly distorted acetabulum. In the iliac wing view, the patient is rolled forty five degrees toward the affected side. The main advantage of this view reveals;

1. The whole posterior margin of the innominate bone.

2. The anterior lip of the acetabulum.

3. The whole iliac wing and crest.

Although small lesion could not be excluded either standard anteroposterior radiogram or by macroscopic inspection of the joint at operation. In fact, all our series were distorted anatomy and all beyond the basis of Shanton's line.

It is true as Ghormley, Kirklin, and Brav reported that radiographic examination was more accurate than macroscopic examination for the detection of subchondral cavities.

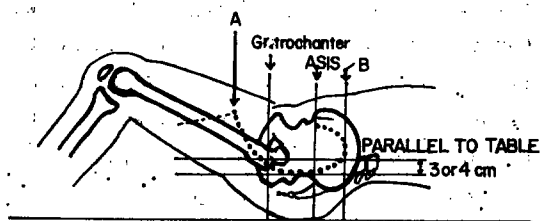
Method of Reconstruction

The Charnley low friction arthroplasty was used with the standard technique slightly modified. It was quite obvious that the division of the adductors and the ileo-psoas was necessary for all in this series. In addition, release of the ileo-tibial tract at the level of distal thigh we found to be beneficial.

As far as surgical approach of the deformed tuberculous hip is concerned, if using the lateral approach it was inevitable during the procedure that there was some anterior misplacement of the gluteus maximus often encountered with this condition's because of long standing fixed flexion. This is also associated with underlying soft tissue often distorted by deeply seated scars.

For this reason, modification of surgical approach is necessary for performing this type of surgery (Lateral question mark incision).

We feels that this approach is of great value for visualizing the Abductor structures as well as many advantages for Exploration of the severe flexion deformities of the hips as shown in Fig. 5.



LATERAL QUESTION MARK APPROACH FOR DEFORMED HIP.

Fig. 5. Lateral question mark approach for deformed hip.

It is also imperative to release the upper end of the femur from the pelvis for ease in gaining length. The division of the adductors and the ileopsoas was necessary for all in this series and it is also essential that the whole distorted degeneration of the remaining capsule be removed.

As a rule, resection of the capsule is not done in the Charnley technique (Charnley 1972). However, it is inevitable when performing this type of surgery unless no recurrence from the dormant source can be guaranteed. The main reason for removal of the whole remaining capsules was the basis of the argument of the hazard of infection (Lazamsky 1970; Dupond and Charnley 1972) and was also argued in previous paper (Wilson, Salvati, Aglietti and Mayo 1973).

Restoration of the distorted abductor mechanism can be achieved to mobilize the detached trochanter with release of the gluteus medius. As far as conversion of an ankylotic hip to hip arthroplasty is concerned this was mostly either a surgically fused hip or spontaneous fusion of the mal-positioned hip during the disease process. The main reason for conversion from ankylotic hip to hip arthroplasty was either disabling pain in the knee or in the lower part of the back.

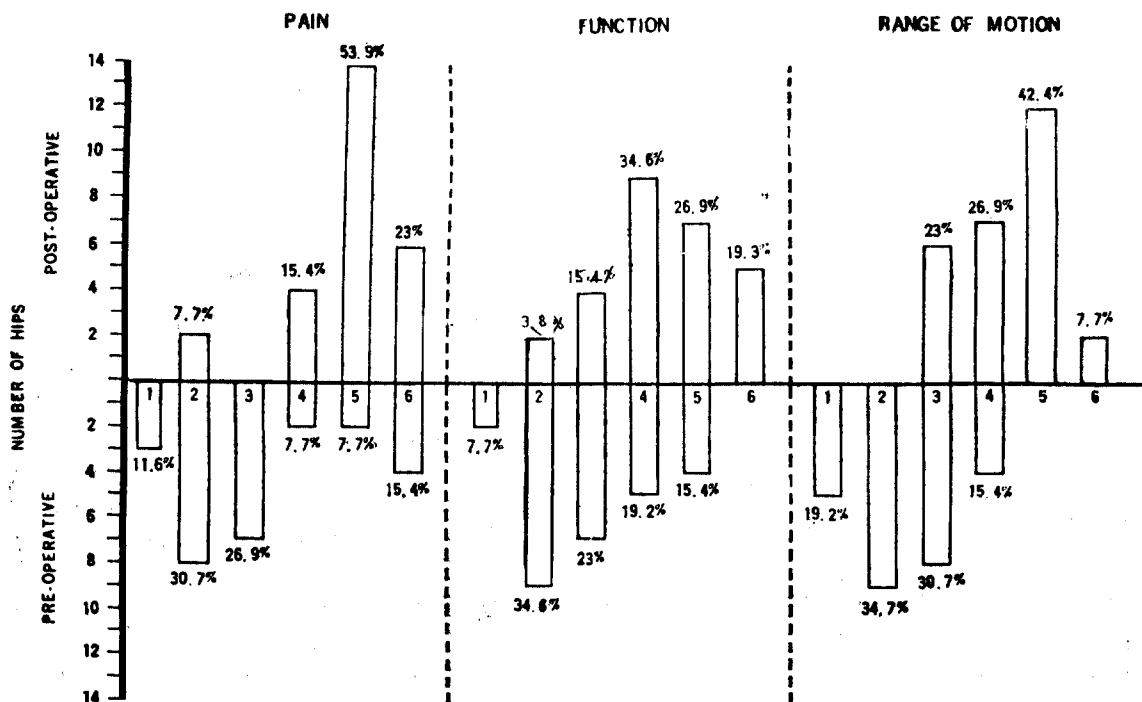


Fig. 6. Pre and postoperative clinical evaluation for pain, function and range of motion. (26 out of 40 cases assessed)

For this reason, the ability to see the trochanter, and thus the function of the abductor muscles was of primary concern in the evaluation of these patients, and this was noted on the routine radiogram of the hips with additional radiograms as described above. In the technique, we preferred during our procedure to osteotomize the corresponding level of femoral neck after trochanter off in most of the cases.

Quality of Early Postoperative Results

The quality of postoperative results consisting of specifics of pain, function and mobility were evaluated according to the d'Aubigne-Postel method modified by Charnley.

Fig. 6 indicated excellent improvement in

most of our series

Fig. 1, 3, 4, and 7 showing the radiographical variety of pre-and post-operative findings in the series.

Complications

The major complications, general, local and technical, in the series of 20 hip operations are:

Table 4. Complications

Type	No. of patient
General	0
Local	
Femoral nerve palsy (partial but recovered: A-C 3)	1
Deep seated infection with draining sinus (recurrence: A-C 5 A-C20)	2
Wire breakage (A-c 3)	1

	Cement fracture (A-C 5)	1
	Late dislocation (A-C 2)	1
Technical	Femoral shaft perforation(A-C 4)	1

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Fig. 1 A. Case AC-11.

Pre and post-operative radiogram of the hip. A 20 yearold women, fixed hip deformity with flexion, adduction secondary to tuberculosis of the left hip. Total hip arthroplasty was done on the basis of pain in hip and knee deformities.

Fig. 1 B. Case AC-11. (Top).

Anteroposterior and lateral radiogram of the Lt. knee showing the marked varus deformity. There were complaints of pain while walking. There was no history of injuries to this knee but deformity may be caused by an adaptational malalignment. (Bottom). Postoperative radiogram after high tibial osteotomy.

Fig. 2. Case AC-17

Part of the pelvis and right hip joint in the case of 30 years old male. Note the mutiloculated area in the acetabulum as well as in the femoral head shown on the left side of picture. Top right is a radiogram of the same patient before LFA. There is a 10 years interval from the left side of picture for comparison. Bottom left is the right femoral head removed at LFA and sectioned in the longitudinal plane.

Bottom right is the sectioned femoral head with focal view. Typical appearance of the effect of the disease is quite obvious. There are also still visible multiloculated old lesions in the bottom left where there is compacted fibrin containing granulation tissue.

Fig. 3 Case AC-4.

Conversion of LFA after 30 years has elapsed from the original tuberculosis, during which period there was no anti-tuberculous regimen.

A(Top-left). Pre-operative radiogram.

B(Top-right). Radiogram of the same patient after LFA.

C(Bottom). In the biopsy when performing LFA was taken from acetabulum of the same patient showing epitheloid cells, giant cells of Langhans type and lymphocytes.(H&E. stain $\times 450$).

Fig. 7 A-B. Case AC-13.

Spontaneous fusion with mal-position of the hip due to disease process. Main reason for conversion to LFA was low back pain.

A(left). Pre-operative anteroposterior radiogram.

B(right). After Charnley low friction arthroplasty in the same patient.

Fig. 4. Bactericidal inhibitive concentration test using bacillus subtilis ACTT 6633(CMW+lgm KM).